THE ECONOMIC VALUE OF NEW JERSEY STATE PARKS AND FORESTS

June 2004

New Jersey Department of Environmental Protection
Division of Science, Research & Technology

THE ECONOMIC VALUE OF NEW JERSEY STATE PARKS AND FORESTS

June 2004

Prepared By:

Jorge Reyes
and
William Mates

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF SCIENCE, RESEARCH & TECHNOLOGY

ACKNOWLEDGEMENTS

This study would not have been possible without the inputs and assistance of a number of colleagues in the New Jersey Department of Environmental Protection, especially the staff of the Division of Parks and Forestry. Special thanks go to the following colleagues who kindly shared information and insights:

Dave Chanda	Asst. Director, Division of Fish and Wildlife
Robert Cartica	Office of Natural Lands Management
Rick Dutko	Office of Natural Lands Management
Dave Edelman	Forest Service
Lynn Fleming	Wharton State Forest
Frank Gallagher	Administrator, State Park Service
Steve Jandoli	Green Acres Program
Donald Kakas	State Park Service
Eric Knudsen	Green Acres Program
Barry Leilich	State Park Service
Ed Lempicki	Chief, Forest Service
Dana Loschiavo	State Park Service
Mary Sue Topper	Office of Deputy Commissioner Joanna Dunn Samson
Beverly Weaver	Office of Historic Sites

This study was prepared by Jorge Reyes of the Bureau of Sustainable Communities and Innovative Technology (BSC&IT), with substantive technical guidance and inputs in the economic analysis from William Mates, Research Scientist/Economist, of the same bureau. BSC&IT is part of the Division of Science, Research and Technology (DSRT), New Jersey Department of Environmental Protection.

Martin Rosen, Chief of the Bureau of Sustainable Communities and Innovative Technologies, DSRT reviewed the draft report and provided valuable comments.

Jeanne Herb, Director of the Office of Policy, Planning, and Science initiated the study and provided general direction. She also convened the staff working group which assisted in the effort.

TABLE OF CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

Background

New Jersey's system of State Parks and Forests (including the associated recreation and natural areas) is over 300,000 acres in size and constitutes a vital natural resource with significant economic value that can be demonstrated and used in comparisons with alternative land-use values. This study estimated a number of key values using existing data and previous analyses.

Methodology

The study identified three general types of values derivable from NJ State Parks and Forests (P&F): direct use values, indirect use values, and non-use values. Use values arise from the actual use of resources while non-use values are generated without any kind of use of the available resource or service. Use values can be direct or indirect as well as consumptive or non-consumptive (depending on whether resources are used up in the process of use).

Direct Use Values

Direct use values are generated from the current use of resources and services. Direct use values identified in State P&F are: Recreation, and Public Service Benefits.

Recreation generates by far the largest benefit flows in terms of economic impact. In recent years State P&F have attracted 15 million visitors annually. Visitor expenditures generate a chain of direct and indirect effects that multiply the initial amount spent, creating additional income and jobs. Using 2001 data, it is estimated that total money generated would be about $807 million (2003$) annually with a present value of $11.3 billion (over 25 years at a 5% discount rate). The recreation value is already captured partly via park fees and associated revenues of the State Park Service amounting to about $6 million annually.

Studies in other states indicate that a category of benefits called " public service benefits" are also important values derived from parks and forests. These include educational benefits of interpretive programs and facilities. This value has not been quantified in this study.

Indirect Use Values—General

Indirect use values refer mainly to benefits deriving from ecological and environmental functions such as watershed protection, biodiversity, climate regulation and other ecosystem services; they also derive from the presence of parks and forests, as well as the expenditures for P&F management that generates secondary economic activity. Several sources of indirect use values are significant in State P&F: Amenity/ Property values, Urban Form Definition, Ecosystem Services, State P&F Management Expenditures, and State P&F-related Construction Expenditures.

Evidence from various studies elsewhere shows that the presence of parks, forests and recreational facilities is a benefit to property values throughout the surrounding areas. So far, there is no specific study of this benefit in New Jersey, but the value of State P&F lands can be proxied using Green Acres recent open space acquisition values (1999-2003). The resulting value is estimated to be $1.2 billion (in 2003$).

Another indirect use value of State P&F, uniquely important for smart growth management in NJ, is "urban form definition". The green infrastructure of the State (of which State P&F form the backbone) create a buffer zone to regulate the spread of development. A measure of this value is the Green Acres open space acquisition costs in the most densely populated counties of the state. Open space cost per acre is strongly correlated with population density. On this basis, it could be argued that the "urban form definition" value of the State P&F acreage in the high population density counties would provide an additional benefit over and above the $32 million value of the open space acquired through Green Acres in the 5 counties concerned (Bergen, Camden, Essex, Middlesex, Hudson and Passaic).

Indirect Use Values—Ecosystem Services

Ecosystem services constitute a substantial source of important benefits. Of greatest importance is watershed protection value. Using existing willingness to pay studies (WTP) done elsewhere in the U.S. and benefits transfer logic, an indicative total WTP to maintain surface water quality of $107 million per year and total WTP to achieve minimum quality of surface water quality of $260 million per year are obtainable. These translate to present values of $1.5 and $3.7 billion (over 25 years at a discount rate of 5%).

Another important set of ecosystem services of State P&F lands are wildlife protection and biodiversity conservation. Here, the relevant values are also substantial. Statewide, the total economic impact of watchable wildlife is documented by the U.S. Fish and Wildlife Service (USFWS) as being more than the combined total economic impact of fishing and hunting activities. State P&F lands contribute almost half of the area for watchable wildlife and hence account for a proportional share of the economic impact. Attempts have been made to determine the value of biodiversity for certain uses (e.g., pharmaceutical research) but, as yet, there is no generally accepted methodology for this purpose. The biodiversity value of State P&F is not quantified in this study.

As the appropriate market develops, a critical ecosystem service (in terms of greenhouse gas/climate change mitigation) that is likely to grow in importance is carbon storage and sequestration. Based on NJ-specific data, State Parks and Forests provide carbon storage value amounting to $97 million and a carbon sequestration value amounting to $3 million annually with a total present value of $43 million (25 years at a 5% discount rate). These estimates are based on a price of $20 per ton of emissions.

Healthy forest ecosystems within State P&F play a vital role in the maintenance of geochemical processes such as soil erosion control and groundwater protection. State and Federal programs pay for erosion control service of land conservation areas comparable in function to State P&F lands. In terms of acreage, the present value of this ecosystem service amounts to more than $282 million (25 years at a discount rate of 5%). For groundwater protection (against pesticide leaching), WTP by NJ farmers is about $37 million (again using benefits transfer approach and relevant studies from neighboring states).

Indirect Use Values—Other

Investment in State Parks and Forest management not only produces important services, it also has a multiplier effect that returns greater than the original amount to the State in real dollars. From the State's average annual expenditure of $30 million for P&F management, total money generated (sales benefits and tax revenues) would be $149 million annually with a present value of $2.1 billion (25 years, 5% discount rate). Also, more than 2,000 jobs would be supported by the sales benefits.

Similarly, construction and capital improvement expenditures related to State P&F generate positive economic impacts. While these expenditures have been below the desired level (averaging only $11 million per year), total money generated (additional sales benefits and tax revenues) annually would be about $52 million which translates to a present value of $726 million (25 years, 5% discount rate). Also, about 700 permanent jobs would be created as a result. Temporary construction jobs would also be created, but the number of such jobs has not been estimated.

Non-Use Values

State P&F have non-use values simply by virtue of their presence or existence, as implied by NJ residents' positive response to open space/conservation bonds put to vote last year (2003) and by pledges to private conservation funds. This existence value as measured by WTP of NJ residents could range from $40 million to $80 million annually (in 2003$) which translates to between $566 million and $1.1 billion in present value terms (25 years, 5% discount rate).

Costs

There are also costs associated with State P&F which include direct costs (of operation, management, maintenance and capital expenditures), indirect costs of adverse impacts attributable to the operations and maintenance of State P&F, and the opportunity costs of the benefits foregone as a result of decision to maintain areas/resources as State P&F. The estimation of these costs, particularly the latter two, involve complex factors and assumptions requiring a study by itself. However, an immediately identifiable opportunity cost is the value of raw material in the form of standing timber in State P&F. Based on the existing growing stock in the 11 State Forests alone, the value of standing timber is estimated to be more than $270 million. The estimate is a minimum since it does not include the 39 State Parks that also contain timber and wood resources of

commercial value. Due to varied species composition and the high quality of forest trees, particularly in the northern part of the State, significant demand for NJ wood products from neighboring states and even from abroad exists.

Conclusions

In sum, the estimated value of the benefits of maintaining State P&F is quite substantial (worth at least $1.2 billion annually and at least $17.2 billion in present value terms). These natural assets form the base for a significant portion of the State's economy, and on economic grounds alone they therefore warrant the capital investments and operating expenditures needed to maintain them in a healthy, productive condition.

The Economic Value of New Jersey State Parks and Forests

I Purpose and Scope of Study

The purpose of this study is to develop a comprehensive analysis of the economic benefits of NJ's State Parks and Forests. In addition to assembling the results of prior relevant studies, the present report presents new analyses of a number of park and forest-related impacts not previously considered with respect to NJ.

This study covers the state parks, state forests and recreation areas under the jurisdiction of the Division of Parks and Forestry but excludes historic resources which will be treated separately. It also excludes the wildlife management areas (WMAs) managed by the NJ Fish and Wildlife Division. Likewise, the state marinas, golf course and miscellaneous areas are excluded. The value of the physical infrastructures in parks and forests such as buildings, roads, bridges is not included in this analysis.

II Background

The responsibility for the protection, conservation and management of the state's natural resources is lodged with the NJ Department of Environmental Protection (NJ DEP). The department is a cabinet level agency that administers programs focused on preserving, sustaining, protecting and enhancing the environment to ensure the integration of high environmental quality, public health and economic vitality for the people of the state. Within the DEP, the Division of Parks and Forestry has management responsibility for New Jersey's state parks and forests. It is dedicated to excellence in the stewardship of the State's rich and diverse historic, cultural, recreational and natural resources for the benefit of present and future generations[1]. The Division is part of the Natural and Historic Resources Group in the NJ DEP. Within the Division are the following Services and Offices: NJ State Park Service, NJ Forest Service, NJ Forest Fire Service, Office of Natural Lands Management, and the NJ Historic Preservation Office.

The State Park Service administers 39 state parks, 11 state forests, 3 state recreational areas, 43 natural areas, 57 historic sites and districts, 5 state marinas, 1 golf course and 22 miscellaneous areas. These units cover a total area of over 375,000 acres and are visited by more than 15 million people per year. Facilities located in these areas include buildings (nearly 1,700)[2], roads (over 400), trails (over 1,500 miles), bridges (326), dams (48), fire towers (21), an interpretive center, and an airstrip.

A related organizational entity that is also under NJ DEP Natural and Historic Resources Group is the NJ Division of Fish and Wildlife whose mission is to protect and manage the state's fish and wildlife to maximize their long-term biological, recreational and

[1] Division mission statement.

[2] Except when otherwise indicated, figures in parentheses refer to the numbers of the facilities identified.

economic values for all New Jersey residents. Currently, there are 120 wildlife management areas totaling over 271,473 acres located throughout the state.

State Resource Areas such as the Pinelands and Highlands regions are defined by the presence of state parks and forests. The Pinelands is the country's first and only National Reserve, U.S. Biosphere Reserve (of the Man and the Biosphere Program), and an internationally important ecological region. The Pinelands Commission, created in 1979 by the state Legislature, is charged with the development and implementation of the Comprehensive Management Plan for the 1.1 million-acre Pinelands.

Recently, Governor James McGreevey issued Executive Order 70 creating the Highlands Task Force and mandating it to make recommendations intended to preserve the natural resources of and enhance the quality of life in the Highlands region which includes 7 counties and 90 municipalities in northern NJ covering an area of more than 1,000 square miles.

III Methodology

Types of Economic Value

In determining the value of a natural resource or environmental service economists use the concept of total economic value (TEV). This is defined as the amount of resources or services, expressed in common units of money, by which society would be worse off if the natural resource or environmental amenity were lost. Conceptually, it is the sum of use value (UV) and non-use value (NUV). Use values arise from the actual use made of a given resource. Non-use values are generated without any kind of use of a resource or service provided.

Use values may be broken down further into direct use values (DUV), indirect use values (IUV), and option value (OV). **Direct use** values generate from the current use of the resources and services provided directly. Examples would be sustainable use of timber and non-timber forest products. Direct use value can either be consumptive or non-consumptive depending on whether the resources are used up in the process.

Products such as fuelwood, pulpwood, medicinal plants, fruits, and poles generate direct consumptive use values. Consumptive use value derives from such goods that can be extracted or harvested from a site. While harvesting of resources can lead to depletion (when extraction exceeds the sustained yield level), these resources if they are renewable (e.g., timber) can be managed sustainably to yield benefits of harvestable products, theoretically, in perpetuity. A consumptive use is thus not inconsistent with sustainable use of a renewable resource.

A non-consumptive use value derives from the service that a site provides. These services have value but do not require any good to be harvested. Recreation (tourism), education, research, etc. are examples of direct non-consumptive use values. While watching wildlife is a good example of a direct non-consumptive use, hunting certain wildlife for food or materials is a direct consumptive use.

Indirect use values refer mainly to benefits deriving from ecosystem or environmental functions such as watershed, climate regulation, and other ecosystem services and natural processes. **Option value** is related to benefits received by retaining the option of using a resource in the future by protecting or preserving it today.

Two significant non-use values are existence values (EV) and bequest values (BV). Existence value arises from the satisfaction of merely knowing that an asset exists, although the valuer has no intention of using it. Bequest value arises when people are willing to pay to conserve the benefits of a resource for the use of future generations.

Methods of Valuation

Normally, economic values are estimated in monetary terms for analytical purposes. Some of the benefits attached to parks and forests are considered "intangible" and these pose difficulties for economic valuation. Intangible benefits and costs are those which defy quantification, or at least direct quantification. In other words, a benefit or cost is intangible when the product or service involved is not sold and so has no market price. Many park and forestry activities (mostly indirect use, option use, and non-use values) enter this intangible category. For example, how can a monetary value (price) be put on the benefits of soil protection, or water regulation, or the aesthetic appeal of forests, or even forest research? A number of different ways exist which permit valuation of at least some of these activities (as discussed below).

In the case of tangible benefits, the market price is used to estimate the value of goods having actual markets, while non-market valuation methods are used for the estimation of value of goods and services without readily available market price information. Several methods are suggested in the literature to value goods and services provided by parks and forests (Pearce and Moran, 1994). These methods can be generally divided into two categories: stated preference and revealed preference methods. The methods under the first category try to determine people's preferences by directly questioning them. Methods in the second category try to discern preferences from peoples' actual behavior.

Among the stated preference methods, the contingent valuation method (CVM) has emerged as an acceptable method to estimate the monetary value of intangible benefits. CVM is essentially a survey approach that asks people what they are willing to pay (WTP) for a benefit, or what they are willing to accept (WTA) by way of a compensation to tolerate a cost, or both[3]. There are four common techniques to carry out CVM: contingent referendum, payment card method, open ended question method, and the bidding game.

Among the revealed preference methods, the travel cost method (TCM) is the most important. It is commonly applied to estimate the monetary value of recreational benefits. The assumption behind the method is that the value of a location (recreational site) is reflected in the costs that visitors incur to travel to it. Other examples of revealed preference methods are: hedonic pricing, change in productivity, and replacement cost.

[3] WTP is typically easier to estimate than WTA. Further, one's WTP is bounded by one's income; one's WTA is not. Thus, most valuation studies estimate WTP.

The concept behind the hedonic pricing approach is that when making a decision to buy or rent a house, households will consider the value of the available services (water, clean air, location, etc.) associated with the housing unit. This approach estimates the value of the specific attribute of a good that is sold only as a bundle of these attributes.

Change in productivity is usually applied to estimate the watershed values of forests and parks. The watershed values can affect the agriculture production or outputs of development projects in and around the forests or parks. It is then possible to quantify the economic value of these non-market benefits by analyzing changes in productivity.

The replacement cost approach is based on the expenditure incurred to replace or restore the non-market service that has been damaged or has declined.

Another method of valuation is to estimate the cost of *not* proceeding with a development project in forest or park area in the interest of conservation. This cost is referred to by economists as opportunity cost. The opportunity costs of conservation include the development benefits foregone. In this method, the costs of conservation represent a minimum value against which the benefits can be judged.

A technique for valuing non-marketed goods and services that has been used to measure value of biodiversity is demand analysis. This involves the application of a general demand model using a constant set of assumptions. An example would be a model of the demand by pharmaceutical researchers for marginal species on the basis of their incremental contribution to the probability of making a commercial discovery.

Benefits Transfer

Detailed data collection to establish economic values can be costly and time-consuming. Thus, a benefits transfer method is sometimes employed to reduce these costs. This approach involves taking an estimate of the economic value of a resource or service from an existing study done elsewhere, and transferring it to a new context, assuming that the existing value can be used as an approximation. A correction factor is sometimes employed to adjust the unit values to consider conditions in the concerned (or policy) site.

There are three main approaches to benefit transfer: a) transferring mean unit values; b) transferring adjusted unit values; and c) transferring demand or benefit functions. Value transfers (i.e., *a* and *b*) encompass the transfer of a single (point) benefit estimate from a study site, or a measure of central tendency for several benefit estimates from a study site or sites (e.g., mean), or administratively approved estimates. Function transfers encompass the transfer of a benefit or demand function from a study site, or a meta regression analysis function derived from several study sites. Function transfers then adapt the function to fit the specific situation of the policy site.

IV Direct Use Values (Non-consumptive)

A. Recreation

Parks and forests hold a wide range of recreational opportunities. They constitute critical habitat for game animals and fish sought by hunters and anglers. Recreational benefits provided by a site are generally considered together as a single source of value although, in fact, they are a result of a number of different services that a site might provide (bathing/swimming facilities, hiking trails, habitat for wildlife viewing, camping areas). A major part of non-consumptive recreational activities such as hiking, bird watching, wildlife viewing and other such pursuits occur within forest stands and natural parks. Ecotourism (nature-based tourism) is a booming business globally and constitutes a potentially valuable non-extractive use of parks and forests. Some sites attract large numbers of visitors. In the last 4 years, New Jersey State parks and forests have attracted 15 million visitors annually.

A1 direct benefits

The reported revenues of the NJ State Park Service from 1994 to 2002 totaled over $65 million or an average of over $7 million annually (Table 1). This includes park fees, permits, and concession/leases which constitute more than half the total revenues from all sources and average about $4.8 million annually ($5.5 million in 2003$).

Park visitors and users also spend about $165 million (in 2003$) annually on goods directly related to park visits (Table 2)[4]. Part of the amount spent is money that would not be spent in the area without the presence of the parks (net new expenditures).

Park visitor and user expenditures along with fees collected total approximately $170 million per year. This amount translates to about $11 per visitor per year.

A2 indirect effects

The amount spent by visitors will be exceeded by the total economic impact generated by such expenditure. Every dollar spent in the local area by visitors yields additional income to owners of park-related businesses (e.g., recreation equipment, restaurants, hotels, and souvenir shops). This is a direct effect. Some of this additional income is, in turn, spent by local businesses on other locally produced goods and services creating a chain of further expenditures and sales benefits to the local economy ("turnovers") which constitute the indirect effects.

The magnitude of the direct and indirect economic stimulus is reflected in multipliers that have been developed by economists to estimate total economic impact. The multiplier is the original $1 purchase plus the part of the $1 that remains within the local or state economy on the various turnovers. Table 2 shows the estimated economic impacts of recreation/tourism related expenditures. Total monetary benefits generated (increased sales, salaries, sales and income tax revenues) in 2001 amounted to $807 million (in 2003 dollars). An estimated 10,605 jobs were also created. Based on total money generated

[4] Taking estimated 2001 P&F park expenditure as annual average.

annually of $807 million, the present value[5] of the stream of monetary benefits is $11.3 billion (over 25 years at a 5% discount rate).

B. Public Service Benefits

Studies in other states also identify a category of benefits called "public service benefits" that parks and forests provide. These include educational benefits of interpretive programs and facilities. Other conceivable benefits might be the health benefits to residents of increased recreational and exercise opportunities, public safety benefits (to non-park users) from park police and fire services and wildland management, and transportation benefits from trails connecting homes, businesses and workplaces. These benefits are difficult to quantify and their estimation has not been attempted in this study.

V Indirect Use Values--General

A. Amenity/Property Values

The presence of parks and recreational facilities is a benefit to property values throughout the surrounding areas; scenic views and direct access to trails and open space increase the value of homes directly adjacent to parkland. While most studies reviewed have focused on proximity to oceans or lakefronts, some evidence exists that living near to forests does in fact secure some benefits in terms of such amenities. Based on a few available studies (Powe *et al.* 1997; Tyrvainen & Miettinen, 2000) it would seem that the presence of a forest or woodland near housing estates increases house prices though in one case (Garrod & Willis, 1992), the tree species had a variable influence: Sitka Spruce stands would reduce the price whereas broadleaved forest would increase it. In 1999, US Forest Service researchers in Lake Tahoe Basin found a strong correlation between average property value and the amounts of public open space in a neighborhood. Their study found that a 10% increase in the ratio of protected public land to total land in a neighborhood, on average, translated into a property value increase of nearly $20,000 (USFS, 1999).

No similar study has been conducted in New Jersey. However, the value of State Forest and Park lands by county can arguably be proxied using Green Acres recent open space acquisition values (1999- 2003) which Table 3 shows. Using this method, the total land value of state forest and parks is estimated to be over $1.2 billion (2003$).

B. Urban Form Definition

The role of parks and forests in providing definition to a region's developed areas and growth management is a significant benefit especially in the case of a highly urbanized state like New Jersey. Urban form definition in the context of New Jersey refers to the fact that green "infrastructure" creates a buffer zone to regulate the spread of development. From another perspective, parks and forests function as protected areas around which sustainable land-use could be implemented in highly urbanized counties of the state. Such a framework is now being identified by Green Acres and the NJ

[5] Present value is defined as the measure of economic value when benefits and costs occur in different time periods. Future benefits and costs are "discounted" by one or more interest rates that reflect the changing value of monetized costs and benefits over time. The conventional assumption in economics is that benefits and costs incurred today should be given more weight than benefits and costs incurred in the future.

Conservation Foundation in the form of a statewide system of interconnected open space and a green infrastructure of forests, wetlands, farms, waterways and recreation lands (called Garden State Greenways). State Parks and Forests form the backbone of this framework. The Greenways initiative aims to minimize the impacts of sprawl and landscape fragmentation and complement New Jersey's smart growth efforts.

State Parks and Forests effectively function as open space in terms of defining urban form. The value of lands in urban fringes that have already been acquired for parklands or open space can thus be used to measure the economic value of urban form definition. High population density is a major feature of an urbanized region. According to the 2000 U.S. Census, the top seven NJ counties in terms of population density account for slightly more than half the state's total population and slightly more than 1/6 of the state's total area. These counties are Bergen, Camden, Essex, Middlesex, Hudson, Passaic, and Union. Table 5 shows population densities and Green Acres open space acquisitions by county during 1999-2003. Open space cost per acre is strongly correlated with population density as shown in Fig.1 (Annex). Based on the corresponding Green Acres (GA) land acquisition values for open space from Table 4, the State P&F acreage in the 7 most densely populated counties (36,406 acres or 5% of the total area of the 7 counties) would provide an additional benefit over and above the $32 million value[6] of the open space acquired through Green Acres in the 7 counties (Table 5).

The increasing importance of urban forestry is also an indicator of the urban form definition value of parks and forests. Urban forestry is the practice of maintaining urban forests, which are the aggregate of all vegetation and green spaces within communities. If the six most populated counties are used as surrogate for urban and suburban areas in the state, then there are more than 640,000 acres of land where urban forestry might be practiced[7]. In early 2003, the U.S. Forest Service and American Forests published a report of a study on Urban Ecosystem Analysis of the Delaware region that covered portions of southern New Jersey. The study documented significant environmental benefits of air pollution control, stormwater management and carbon sequestration from urban forests the estimated economic value of which amount to billions of dollars (American Forests, 2003). Just for the NJ portion of the study area[8], the reported benefits are $4.1 million annually for removal of air pollutants, $3.3 billion of avoided costs of stormwater-related construction, and 5,200 tons per year of sequestered carbon.

VI Indirect Use Values—Ecosystem Services

Biophysical processes ("ecosystem functions") take place within an ecosystem. They can be characterized apart from any human context (e.g., fish and waterfowl habitat, cycling

[6] Sum of GA open space acquisitions of the 7 counties of Hudson, Essex, Union, Bergen, Passaic, Middlesex and Camden (second column, Table 4a).

[7] Source: Far Horizons Corporation, 2003 (see footnote 16).

[8] While composition of forests in terms of species may differ in northern (where all except 1 of the most densely populated counties are located) and southern New Jersey (an area of which was included in the study), research indicates that the differences (in terms of benefits) could be mitigated by management techniques commonly applied in urban forestry.

carbon or trapping nutrients) though they are generally affected by human activities. Ecosystem *services* are the outcomes from ecosystem functions that benefit society (e.g., better fishing and hunting, cleaner water, better views, 'free' wild pollinators, safer or less vulnerable areas to natural disasters, lower global warming, new discoveries for pharmaceutical uses, or more productive soils).

These services provided by natural ecosystems are critical to survival, and humans probably could not live without them (Daily, 1997). Forests contribute more than many other terrestrial ecosystems to climate relevant cycles and processes and also to biodiversity related processes. Forest ecosystem services, as with other nature-based services, have also been viewed to be of great economic value (Constanza *et al.* 1997, Pearce & Pearce 2001, and Pearce & Moran 2001). In certain forest valuation studies conducted in specific circumstances, services like hydrological protection or carbon storage actually show higher values than forest products[9].

A. Watershed Protection/ Hydrological Services

Four water-related benefits from forest ecosystems are: a) water quality, b) flow regulation, c) water supply, and d) aquatic productivity. Scientific evidence shows that, except for highly polluted areas, water purity (e.g., for drinking water, hydroelectric power plants or fishing) is likely to be better from forested catchments due to natural water holding and filtration capacities of forest ecosystems. Valuation of forest hydrological services can be done in several ways. One is to value the cost of replacing the service. Another is to value the economic activities that depend directly on the service (e.g., dams and hydroelectric facilities). In the case of valuable aquatic life, willingness to pay (WTP) methods could be used to demonstrate market potential.

As an application of the replacement cost approach, the New York City case has been widely cited (Echavarria and Lochman, 1999). The city invested $1 billion in land protection and conservation practices in its watershed areas. Without the services of these protected watershed areas, the city would have spent $4 - 6 billion on filtration and treatment plants. Elsewhere in the U.S. (e.g., in Portland, Oregon; Portland Maine; and Seattle, Washington), researchers have found that every $1 invested in watershed protection can save between $7.50 to almost $200 in costs for new filtration and water treatment facilities (Reid, 1999). The USDA Forest Service assessed the marginal value of water on National Forest Lands nationwide to be more than $3.7 billion per year (Dombeck, 1999). This value mainly relates to the value of raw water supplied from the forests and does not include the value of maintaining fish species nor the savings to municipalities that have reduced filtration costs. Neither does it account for the millions of visitor days where people are satisfied by the simple act of walking beside a clean stream, lake, or river.

[9] Natural forests can be managed for multiple uses (e.g., watershed protection, carbon storage/sequestration and timber production) under sustained yield. The level of net benefits from forest preservation depends on the alternative land use as well as local climatic, biological, geological, and economic circumstances. When the alternative is agroforestry or forest plantations (depending on the management system), preservation of the natural forest may not offer net benefits from hydrological benefits. Conversely, forest preservation can yield substantial benefits where it averts erosion-generating changes such as road building, annual cropping, or overgrazing; where affected areas impinge directly on streams, reservoirs or populated areas; and where affected watersheds are small, steep and erosion prone.

A study in Rhode Island (Johnston *et al*, 1999) determined that there was a willingness to pay (WTP) increased fees and charges for improved catchment health (WTP to maintain average surface water quality and WTP to improve to minimum acceptable level of surface water quality throughout the catchment). WTP values of $33 and $81 per household per year, for the former and latter respectively, were obtained. Applying these values (by benefits transfer logic) to NJ, we obtain results shown in Table 6. These results are arguably indicative of what might be expected if a similar study were conducted in New Jersey

B. Habitat Provision/ Wildlife Protection/ Biodiversity Conservation

Of the rare species found in the state, 36.24% have been documented on NJ Parks and Forestry Division lands. An unpublished DEP economic impact study of the proposed regulation governing modification of endangered and threatened species habitats in New Jersey indicated that the benefits to society from species protection (as measured in WTP) amount to hundreds of millions or even billions of dollars in present value terms. A report by the NJ Fish and Wildlife Division show that watchable wildlife in the state attracted 1.9 million participants in 2001. The economic impact of watchable wildlife, a substantial share of which occur in P&F lands, was greater than the combined contribution of fishing and hunting activities.

The study of the economics of biodiversity is still in its infancy and only a few studies have attempted to quantify its value. Among these is Simpson *et al.* (1996) which sought to determine the private *in situ* value of the marginal[10] species for use in pharmaceutical research and private value of the marginal hectare[11] of threatened habitat for pharmaceutical research. Using the technique of demand analysis, the study obtained one-time values of $10,000 for marginal species and $20 per hectare for threatened habitat (values in 1996$). The estimates are generic and for private rather than public values. The researchers sought to explain the relatively low values obtained as due to the following factors:

a) individual redundancy, i.e., if all representatives of a species produce a particular compound, individuals in excess of the number needed to maintain a viable population are redundant;

b) species redundancy, i.e., instances in which identical drugs, or drugs with similar clinical properties, have been isolated from different species; and

c) medical redundancy, where different therapeutic mechanisms may be effective in treating the same symptoms.

[10] In studies that ascertain values for genetic resources *in situ*, every "unit" (species or habitat area) of biodiversity is viewed as making an equal marginal contribution to the success of the bioprospecting enterprise; that is, one species or one hectare of habitat is about as valuable as any other.

[11] 1 hectare = 2.47 acres

Given these caveats, Simpson's results at best provide indications of the order of magnitude of the benefits. Other studies point to different approaches that could yield substantially different results. Thus, at this point, there is no generally accepted approach or methodology for assessing biodiversity value. In view of this, no attempt has been made in this study to quantify the biodiversity value of State P&F.

C. Carbon Sequestration/Storage

Carbon dioxide is a major greenhouse gas which most scientists believe contribute significantly to global climate change. Forests store and sequester carbon. By photosynthesis, growing trees absorb carbon dioxide and convert it to carbon bound in the growth of biomass. Thus by such process, forests "sequester" carbon. The biomass of a tree is about 50% carbon by weight. Forests also "store" carbon in the leaves, stems, branches, boles, and roots of trees and other plants in the forest; in the organic litter or dead plant material on the forest floor; and in organic matter in the forest soil. As carbon sinks, forests can thus help mitigate climate change.

Several studies suggest a potentially very large effect for these carbon storage functions (Brown & Pearce, 1994; Dixon *et al.*, 1994; IPCC, 2000). A closed primary[12] forest stores in vegetation and soils around 250 tons of carbon per hectare and if converted to shifting agriculture[13] would release about 200 tons, and a bit more if converted to pasture or permanent agriculture. Open forests start with around 115 tons of carbon per hectare and lose between a quarter and a third of this upon conversion. To the extent that the carbon stored in forests is at risk of being released into the atmosphere, it has a high economic value. A review of the literature (Clarkson, 2000) suggests a consensus value of $34 per ton as representative of the estimated social cost of emitting carbon, defined as the damage avoided from a given level of emissions abatement[14].

For practical purposes a better guide to the value of carbon is what is likely to be traded at in a "carbon market". While markets for carbon dioxide (CO2) are not well established yet, there has been some experimental trading, usually in the $1 to $20 per ton range (for examples, see Egenhofer & Mullins, 2000; and Williams *et al.*, 2000). A recent study done for the US Forest Service[15] (Far Horizons Corporation, 2003) identifies opportunities for carbon sequestration and CO2 emissions credits from New Jersey forests and forestry projects. It estimates that the total area of public land under good management available for carbon sequestration is 408,975 acres (Table 7).

[12] The adjective "closed" describes canopy at the main level of forests formed by a more or less continuous cover of branches and foliage of adjacent trees. The canopy is closed because light cannot reach the forest floor directly. A "primary" forest is one that has not been logged previously.

[13] Agriculture still practiced in some developing countries in the form of slash and burn.

[14] Several methods have been used by economists to derive such estimates; the details are rather technical and are reviewed in Clarkson (2000).

[12] "Carbon Sequestration and CO2 Emissions Credits: A Market-Based Forest Conservation Program for New Jersey". October 2003. Study prepared for the U.S. Forest Service, Northeastern Area by Far Horizons Corporation, Princeton Junction, NJ.

In another study, the U.S. Forest Service Northeastern Research Station which covers NJ estimated forest carbon storage in the state at about 38.3 tons per hectare while gross carbon sequestration is at the 1.2 ton per hectare per year level. State Parks and Forests covering 312,844 acres or 126,606 hectares would have carbon storage of 4.8 million tons valued at about $96 million (at the upper end of the trading range or $20 per ton of carbon emission credits). Likewise, carbon sequestration would be 151,927 tons per year valued at about $3 million (again at $20 per ton of carbon emission credits)[16]. The present value of carbon sequestration in State Forests is $139.8 million (Table 7a).

D. Other Ecosystem Services

Healthy forest ecosystems play a crucial role in maintenance of ecological and geochemical processes such as nutrient cycling and sequestration, pollination and seed dispersal, natural pest control, groundwater leaching prevention, and soil erosion control. The economic value of these services are significant. For example, one report (Moskowitz and Talbeth 1998) estimates that the cost to U.S. agriculture of replacing natural pest control services with chemical pesticides would be about $54 billion annually. Another report (Reid 1999) notes that in Costa Rica, a citrus plantation pays an adjacent forested conservation area $1 per hectare every year to provide natural pest control services.

In New Jersey, the state implements a USDA-supported Conservation Reserve Enhancement Program (CREP) which provides an actual measure of the value of soil erosion control[17]. Using 30,000 acres of eligible farmland, the program seeks to maintain ecological functions of streams, reduce non-point source pollution from runoff (26,000 pounds of phosphorus and 7 million pounds of total suspended solids annually), and maintain a high level of water quality. The economic incentives offered by the program could be used to estimate the soil erosion control value of state parks and forests which perform the same function as the eligible farmlands under CREP. The economic incentives include a one-time payment of $100 to $150 per acre for enrolment of the land and an annual payment based on soil rental rate over the life of the program (10 years). Based on the one-time incentive (lower bound) of $100 and the cash rent for agricultural land in NJ in 2002 of $55.50 (or $56.86 in 2003$) per acre, the estimated present value of soil erosion control of land covered by State Parks and Forests would be about $168 million [10 years, at a 5% discount rate] or $282 million [25 years, at a 5% discount rate] (Table 8).

[16] Carbon sequestration units (CSUs) are measured in tonnes or metric tons. A CSU is defined as the amount of organic carbon sequestered in wood or soil that is equivalent to the removal of one tonne of carbon dioxide from the atmosphere (National Carbon Offset Coalition). A tonne or 1 metric ton is defined as 1,000 kilograms, the equivalent of 2,200 pounds.

[17] The State and Federal governments through CREP actually pay for this service. Thus, its use as a surrogate measure of the erosion control value of State P&F lands is legitimate. Value for soil erosion control will not be zero even if CREP ceases to exist because soil erosion if left uncontrolled has economic consequences. CREP is one mechanism that emerged to express the value of soil erosion control.

A study of farmers' willingness to pay to prevent leaching of pesticides into groundwater conducted in the neighboring states of New York, Pennsylvania, and Maryland obtained WTP values of $3,475 and $7,050 per farm (Lichtenberg and Zimmerman, 1999). These values could also be used as surrogate measure of the groundwater protection value of protected areas. Again applying the study results to NJ (by benefits transfer logic) where there are 9,600 farmers, the one-time value (based on the lower figure inflated to 2003) of groundwater protection would be about $37 million (Table 9).

These other ecosystems services are therefore of significant economic value as shown by the two examples above.

VII Indirect Use Values—Other

A On-going Management of State Parks and Forests

According to the US National Park Service the provision of parks and recreation services play an influential role in a state's economic development. When companies choose to set up business or relocate, the availability of properly managed recreation, parks and open spaces is high on the priority list for site selection. (This "business attraction value" thus helps justify public investment in parks[18]). Moreover, investment in the budget of a state parks agency not only produces important services it also has a multiplier effect that returns greater than the original amount to the state in real dollars.

A1 direct effects

From 1993 to 2002, the NJ State Park Service spent an annual average of $30.4 million (2003$) for management of the state parks and forests, including expenditures on salaries, equipment, supplies and services (Table 10).

A2 indirect effects

a) The workers and companies that benefited from the Service's expenditures on management, in turn, purchased additional goods and services, thus generating additional economic activity (the multiplier effect). Annually, the initial agency expenditures of the Service would generate approximately $61 million in direct and indirect sales assuming a multiplier of 2 times (Table 11).

b) The sales benefits would generate sales and income tax revenues of $5.3 million per year.

c) A total of 1,830 new jobs would be supported by the sales benefits.

d) Total money generated would be $135 million per year (2003$) which translates to a present value of $1.9 billion.

B. State Parks and Forests-related Construction

The level of funding for new construction and capital repairs in State Parks and Forests in recent years has left many capital needs unfunded. Capital funds have varied from year to year as these were tied to intermittent bond issues or the availability of funds in a given year's budget. Nonetheless, whatever investments in construction have been made

[18] This value is not separately quantified in this report.

generated significant positive impacts. The construction or rehabilitation of state park facilities are an important source of construction and supplier jobs. After being built, the permanent facilities induce other, long-term investments and jobs.

B1 direct effects
The reported capital improvement expenditures for state parks and forests averaged more than $10 million (2003$) annually (Table 12). These expenditures create temporary construction jobs that in turn produce indirect sales and tax revenues. These temporary impacts are not estimated in this report.

B2 indirect effects
a) The investment in new construction can generate more than $23 million in added sales as a multiplier effect (Table 13).
b) The additional sales would result in $1.6 million in sales and income tax revenues.
c) A total of about 700 permanent new jobs would be created.
d) Total money generated would be more than $51 million annually which translates to a present value of $726 million.

VIII Non-use Values

The state parks and forests have non-use values as implied by NJ residents' positive electoral response to open space/conservation bonds put to vote last year (2003) and by pledges to private conservation funds. As earlier indicated the non-use values are the most difficult to quantify but a study by Silberman *et al. (1992)* tried to measure the existence value of beach nourishment from Seabright to Ocean Township, NJ. Using two CVM surveys, the researchers asked respondents to place value on the existence of beach nourishment, whether or not they would use the beach themselves. The sample mean annual WTP obtained ranged from $10 to $20. In the absence of studies that deal directly with the NJ state parks and forests, the results of the Silberman study could be applied to get an indication of the magnitude of the existence value of these resources (Table 14). The total WTP per annum would then range from $40 to $80 million annually (2003$).

IX Costs

A complete economic analysis would include the costs involved in maintaining State Parks & Forests, comprising direct, indirect and opportunity costs. **Direct** costs include capital expenditures, development and maintenance of facilities, and all recurrent management and administration costs. These costs were considered above as source of economic benefits, but they also represent costs. **Indirect Costs** measure the value of adverse impacts attributable to the operations and maintenance of State P&F, including property damage or personal injuries (e.g., caused by wildlife). **Opportunity Costs** represent the value of benefits foregone as a result of the decision to maintain an area and its resources as State P&F, instead of, e.g., opening the area to development.

The estimation of these costs, particularly the indirect and opportunity costs, requires complex modeling, extensive data, and the making of numerous assumptions, and would therefore entail a major study all by itself. Thus, such estimates are not included in this study. However, it is possible to consider here an immediately identifiable opportunity cost that can be estimated in a straightforward manner. This is the raw material value of standing timber in State P&F which is foregone when the P&F are maintained in their existing state.

Wood has traditionally been considered as the major raw material derived from forests. While New Jersey is not considered as a major timber-producing state, 88% of the State's 2.17 million acres of total forestland or nearly 1.9 million acres of this renewable resource is classified as timberland that is potentially available for sustained yield management[19]. Although timber production under sustained yield and multiple-use management allows some compatibility with provision of some kinds of non-consumptive forest uses, harvesting for timber products on forested public lands that are reserved (e.g., parks, wildlife preserves, and wetlands) is administratively restricted. The commercial value of the potentially harvestable timber in State Forests[20] which comprise a sizeable portion (238,336 acres or 11%) of New Jersey's total forestlands could be estimated.

For 1999, based on U.S. Forest Service inventory, the average volume of growing stock in NJ forestlands is 4,294 board feet per acre. Applying this to the areas covered by major species groups in the 11 State Forests yields a timber volume equivalent to over 1 billion board feet. The value of standing timber[21] in just the NJ State Forests alone is estimated

[19] In 1999, private individuals and enterprises owned 62% of New Jersey's forestlands. NJ Forest Service reported that for FY 1999, private consulting foresters sold 4.5 million board feet of timber with a stumpage value of $1, 293,000. Stumpage value refers to the current price that would be paid by a contractor to a landowner for timber designated for harvest as it stands uncut in the woods.

[20] Most of the state parks also contain forest stands, wooded areas or related vegetative cover and inclusion of these areas will raise the percentage of state-owned forestlands vis-à-vis NJ's total forestlands.

[21] In addition to growing stock, topwood (wood and bark of above merchantable height), cull (rotten or rough trees) and non-growing stock may also have commercial value. Due to lack of data, this is not estimated here.

to be over $270 million based on current stumpage prices of major species groups (Table 15).

X Conclusions

Attachment **A** summarizes the estimated economic benefits that New Jersey derives from the State Parks, Forests, and associated Recreation Areas under the jurisdiction of NJDEP's Division of Parks and Forestry. As can be seen, the benefits total at least $1.2 billion annually and $17.2 billion in present value terms. These two figures are the minimum values since they are based on the lower bounds of all ranges. Even apart from that, the two figures cited above understate the true economic value of the State P&F, since values have not been estimated for a number of benefits due to methodological or data limitations. In addition to the monetary benefits, the State P&F generate almost 14,000 jobs (excluding temporary construction jobs). New Jersey thus derives very large benefits from its State Parks, Forests, and Recreation Areas, and on economic grounds alone these areas deserve to be preserved and protected.

REFERENCES

American Forests and USDA Forest Service. 2003. Urban Ecosystem Analysis Delaware Valley Region: Calculating the Value of Nature. American Forests, Washington, D.C.

Brown, J. and Pearce, D.W. 1994. The Economic Value of Carbon Storage in Tropical Forests, in J. Weiss (ed.), The Economics of Project Appraisal and the Environment, pp. 102-23. Edward Elgar, Cheltenham.

Clarkson, R. 2000. Estimating the Social Cost of Carbon Emissions. U.K. Department of the Environment, Transport and the Regions, London.

Constanza, R., R. d'Arge, R. de Gout, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. O'Neill, J. Parvelo, R. Raskin, P. Sutton and M. vanden Belt. 1997. The Value of the World's Ecosystem Services and Natural Capital. *Nature* 387: 253-260.

Daily, G. (ed.). 1997. Nature's Services: Societal Dependence on Natural Ecosystems. Island Press, Washington, D.C.

Dixon, R.K., S. Brown, R.A. Houghton, A.M. Solomon, M.C. Trexler, and J. Wisnieski. 1994. Carbon Pools and Flux of Global Forest Ecosystems. *Science* 263: 185- 190.

Dombeck, M. 1999. The World's Largest Water Company. Presented at the Outdoor Writers Association of America Conference, 21 June 1999, Sioux Falls, South Dakota.

Echevarria, M. and L. Lochman. 1999. Policy Mechanisms for Watershed Conservation: Case Studies. The Nature Conservancy, Arlington, Virginia.

Far Horizons Corporation. 2003. Carbon Sequestration and CO2 Emissions Credits: A Market-Based Forest Conservation Program for New Jersey. Study prepared for the U.S. Forest Service, Northeastern Area.

Farm Service Agency. 2004. Fact Sheet Conservation Reserve Enhancement Program, New Jersey State. USDA/FSA website: www.fsa.usda.gov/dafp/cepd/default.htm accessed 02/02/2004.

Garden State Preservation Trust. 2001. Stewardship Taking Care of Our State Public Lands: Report to the Governor & Legislature. GSPT, Trenton, New Jersey.

Garrod, G. and Willis, K. 1992. Valuing Goods' Characteristics: An Application of the Hedonic Price Method to Environmental Attributes. *Journal of Environmental Management* 34: 59-76.

Global Insight. 2003. Dynamic Tourism Forecasting Model for New Jersey. Prepared for the New Jersey Office of Travel and Tourism, Trenton, New Jersey.

Global Insight. 2003. The New Jersey Tourism Satellite Account: A Comprehensive Understanding of the Economic Contribution of Travel and Tourism in the State of New Jersey. Prepared for the New Jersey Office of Travel and Tourism, Trenton, New Jersey.

Griffith, D. and R. Widmann. 2001. Forest Statistics for New Jersey: 1987 and 1999. USDA Forest Service, Northeastern Research Station, Newton Square, Pennsylvania.

IPCC. 2000. Land Use, Land Use Change and Forestry. Summary for Policy Makers. A Special report of the Intergovernmental Panel on Climate Change. United Nations Environment Programme (UNEP)/ World Meteorological Organization (WMO), Nairobi/ Geneva.

Johnston, R. J., Swallow, S. K., and Weaver, T.F. 1999. Estimating Willingness to Pay and Resource Tradeoffs with Different Payment Mechanisms: An Evaluation of a Funding Guarantee for Watershed Management. *Journal of Environmental Economics and Management* 38: 97-120.

Lichtenberg, E. and Zimmerman, R. 1999. Farmers' Willingness to Pay for Groundwater Protection. *Water Resources Research* 35: 833-841.

National Association of State Park Directors. 2003. The 2003 Annual Information Exchange: A Statistical Report of State Park Operations for the Period July 1, 2001 Through June 30, 2002. NASPD, Tucson, Arizona.

New Jersey Division of Parks and Forestry. 2003. FY03 State of the Division Report. New Jersey Department of Environmental Protection, Trenton, New Jersey.

New Jersey Division of Parks and Forestry (F. Gallagher). 2003. Economic Impact of Visitors to Division of Parks and Forestry Sites: Statewide Money Generation Model [National Park Service Methodology] Trends 2001. New Jersey Department of Environmental Protection, Trenton, New Jersey.

New Jersey State Park Service. 2003. Attendance Report Fiscal Year 2002 (July 1, 2001 to June 30, 2002). New Jersey Department of Environmental Protection, Division of Parks and Forestry, Trenton, New Jersey.

Pearce, D.W. and Moran, D. 1994. The Economic Value of Biological Diversity. Earthscan, London.

Pearce, D.W. and Pearce, C. (eds.). 2001. Valuing Environmental Benefits: Case Studies from the Developing World. Edward Elgar, London.

Pearce, D.W. and Moran, M. 2001. The Value of Biological Diversity: A Handbook. OECD, Paris.

Powe, N., Garrod, G., Brandon, C. and Willis, K. 1997. Using a Geographical Information System to Estimate a Hedonic Price Model of the Benefits of Woodland Access. *Forestry* 70: 139-149.

Reid, W. V. 1999. Capturing the Value of Ecosystem Services to Protect Biodiversity. World Resources Institute, Washington, D.C.

Silberman, J., D. A. Gerlowski and N. A. Williams. 1992. Estimating Existence Value of Users and Non-Users of New Jersey Beaches. *Land Economics* 68: 225-236.

Simpson, R. D., Sedjo, R.A. and Reid, J.W. 1996. Valuing Biodiversity for Use in Pharmaceutical Research. *Journal of Political Economy* 104: 163-185.

Tyrvainen, L. and Miettinen, A. 2000. Property Prices and Urban Forest Amenities. *Journal of Environmental Economics and Management* 39: 205-223.

U.S. Fish and Wildlife Service/ U.S. Census Bureau. 2002. National Survey of Fishing, Hunting and Wildlife-Associated Recreation 2001. U.S. Department of the Interior and U.S. Department of Commerce, Washington, D.C.

U.S. Forest Service. 1999. Lake Tahoe Watershed Assessment Vol. 1. U.S. Department of Agriculture, Washington, D.C.

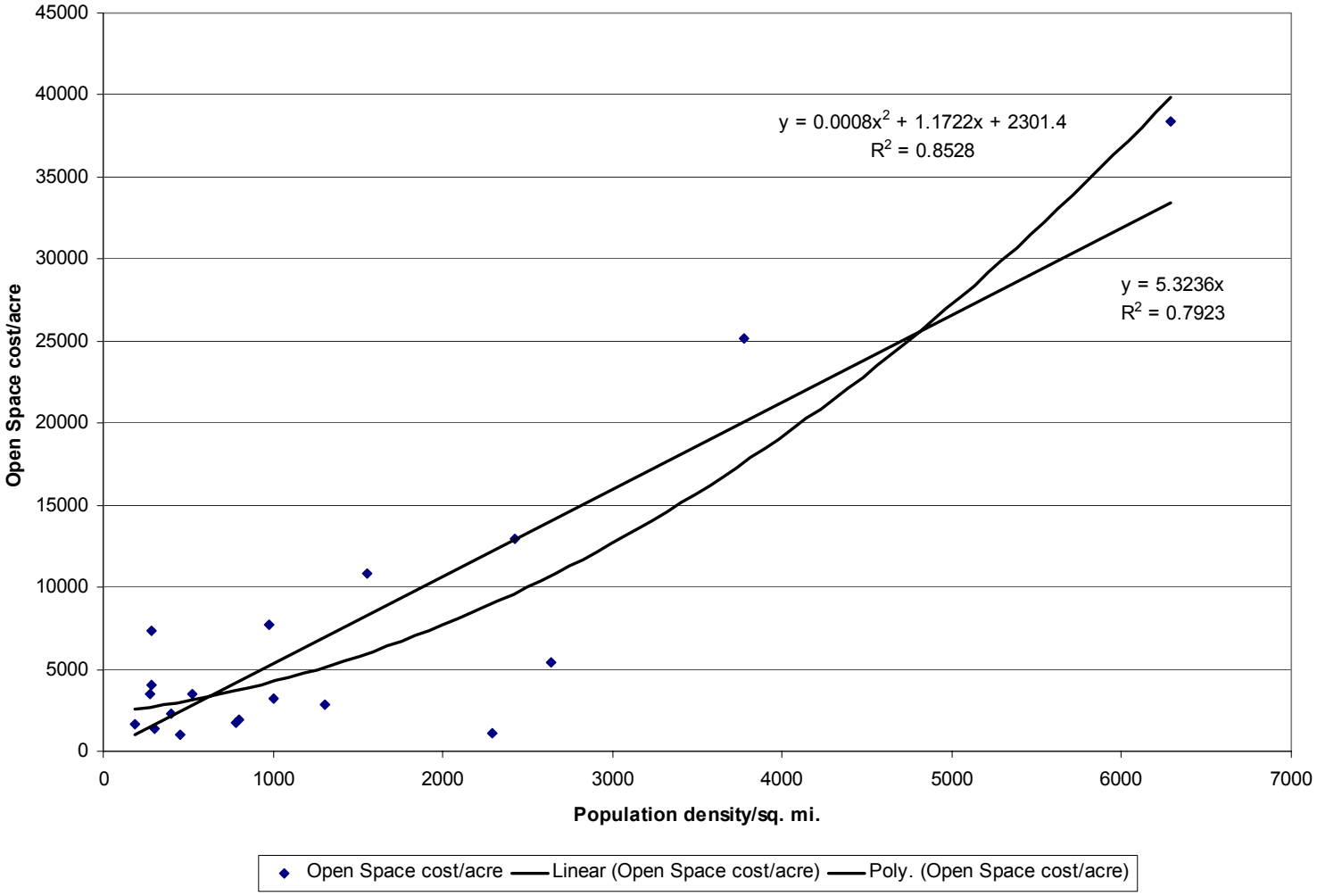
Attachment A: Estimated Benefits of State Parks and Forests of New Jersey (2003 $MM)					
Benefit	**References**	**Measure(s) Used**	**Jobs**	**Benefit/Yr**	**PV Benefit**
Direct Use Values (non-consumptive)					
Recreation/Tourism—Direct Effects	Pp. 11 T. 1	Park revenues (user expenditures)		5.4	76.3
Recreation/Tourism—Indirect Effects	Pp. 11-12 T. 2	Total money generated (increased sales)		807.0	11,374.0
		Jobs from new sales	10,620		
Public Service Benefits	P. 12	Not quantified in this study			
Indirect Use Values—General					
Amenity/Property Values	Pp. 12-13 T. 3	Home property values		Not quantified	Not quantified
Urban Form Definition	Pp. 13-14 T. 4, T. 5	Value of open/greenspace in urbanized areas proximate to P&F		1.2	16.5
Indirect Use Values—Ecosystem Services					
Watershed protection-hydrological services	Pp. 14-15 T. 6	WTP to maintain or improve watershed health		107-260	1,508-3,664
Habitat-Wildlife Protection-Biodiversity	Pp. 15-16	Value of marginal species and marginal habitat		Not quantified	Not quantified
Carbon Storage and Sequestration	Pp. 16-17 T. 7 , T. 7a	GHG emission credit value of carbon storage/sequestration		9.9	139.8
Other Ecosystem Services	Pp. 17-18 T. 8	Conservation reserve value (soil erosion control)[22]		20.0	282.0
	P.18 T.9	WTP of farmers for groundwater protection		2.6[23]	36.8

[22] PV based on 25 years.
[23] Annual amortization 25 years, 5%

Attachment A: Estimated Benefits of State Parks and Forests of New Jersey (2003 $MM)					
Benefit	**References**	**Measure(s) Used**	**Jobs**	**Benefit/Yr**	**PV Benefit**
Indirect Use--Others					
On-going Management of P&F—Direct Effects	P. 18 T. 10	State Park Service (SPS) expenditures		30.5	429.4
		SPS jobs[24]	678 (permanent) 484 (seasonal)		
On-going Management of P&F—Indirect Effects	Pp. 18-19 T. 11	Increased sales		135.4	1,908.2
		Jobs from new sales	1,830		
State P&F-related Construction—Direct Effects	P. 19 T. 12	Capital improvement expenditures		10.4	146.5
		Temporary construction jobs	not est'd		
State P&F-related Construction—Indirect Effects	P. 19 T. 13	Increased sales		51.5	726.0
		Permanent jobs created	708		
Non-Use Values					
Existence Value	P. 19 T. 14	WTP for conservation of P&F		40.2-80.3	566.1-1,132.2
Grand Totals[25]			13,957[26]	1,221.1	17,209.6

[24] State Park Service, 2003, State of Division Report.
[25] Only lower-bound values were added, so grand total is a minimum for the estimated benefits.
[26] Counting seasonal jobs at 25%.

Fig. 1: Open Space Cost/Acre as a Function of Population Density



TABLES

Table 1 NJ State Park and Forest Fees/ Concession/ Leases, 1994 - 2002

Year	Total Revenue Current $ (a)(b)	Est'd. Fee & Lease Rev. (F/L) (c)	F/L % of Total Rev.	Inflation Factor (d)	F/L Revenue in 2003 $ (d)
1994	6,762,749	4,869,179	72%	1.2099	5,891,399
1995	6,649,722	4,521,811	68%	1.1846	5,356,477
1996	6,914,474	4,909,276	71%	1.1846	5,815,689
1997	6,675,952	4,406,128	66%	1.1355	5,003,020
1998	7,509,434	5,031,321	67%	1.1117	5,593,212
1999	7,840,448	5,253,100	67%	1.0884	5,717,407
2000	7,282,667	4,952,214	68%	1.0656	5,276,998
2001	7,287,613	4,882,701	67%	1.0496	5,124,884
2002	8,163,179	4,816,276	59%	1.0214	4,919,344
Total	**65,086,238**	**43,642,006**			**48,698,430**
Average	**7,231,804**	**4,849,112**	**67%**		**5,410,937**
Present Value					**76,261,442**

Sources and Notes:

a) NJ Division of Parks and Forestry, FY '03 State of the Division Report, March 2003

b) Total revenues include $22 million from marinas and Spring Meadows golf course.

c) Revenue from fees/concession/leases estimated from graph in State Park Revenue Sources 1994- 2002

d) 2003 $ calculated using average annual inflation rate, 1994- 2003 (Urban, All-Item CPI): 2.14%

e) PV: 5% discount rate, 25 years.

Table 2 Estimated Benefits of Recreation/Tourism Expenditures based on 2001 Visitor Data

Estimated park visitor volume (a)			**2001 Data**			
(A) Total Daytime visitors			14,638,465			
(B) Daytime visitors to Historic Sites			395,681			
(C) Daytime visitors to Parks and Forests (A - B)			**14,242,784**			
(D) Daytime visitors to P&F <30 miles = C x	70%		9,969,949			
(D) Daytime visitors to P&F >30 miles = C x	30%		4,272,835			
			14,242,784			
(F) Overnight visitors to P&F			**425,469**			
Estimated park visitor expenditures (excl. sales tax and user fees)			**2001 $**			**2003 $ (e)**
(G)Expenditure per daytime visitor (< 30 miles) *[b]*		$	8.60			
(H) Expenditure per daytime visitor (>30 miles) *[b]*		$	14.80			
(I) Expenditure per overnight visitor *[b]*		$	36.90			
(J) Daytime visitor (< 30 miles) expenditures (D x G)		$	85,741,561			
(K) Daytime visitor (> 30 miles) expenditures (E x H)		$	63,237,958			
(L) Overnight visitor expenditures (F x I)		$	15,699,806			
(M) **Total P&F visitor expenditures** (J+K+L)		**$**	**164,679,326**		**$**	**172,847,461**
Estimated increased sales	Multipliers (b)					
(N) Daytime visitors <30 mi. (J x multiplier)	2.147	$	184,087,132			
(O) Daytime visitors >30 mi. (K x multiplier)	2.147	$	135,771,896			
(P) Overnight visitors (L x multiplier)	2.145	$	33,676,084			
(Q) **Est. total increased sales** (N + O + P)		**$**	**353,535,112**		**$**	**371,070,542**
(R) Sale tax rate				6%		
(S) **Sales tax revenue** (Q x R)		**$**	**21,212,107**		**$**	**22,264,233**
(T) Portion of sales subject to income tax *[c]*				30%		
(U) State income tax rate				2.50%		
(V) **Income tax revenue** (Q x T x U)		**$**	**2,651,513**		**$**	**2,783,029**

Table 2, Cont.

(W) Increased sales in million dollars (Q/1,000,000)	$	354		
(X) Jobs multiplier per $1 million sales *[b]*		30		
(Y) **New jobs from sales benefits** (W x X)		**10,620**		
(Z) Annual salary per new employee *[d]*	$	35,963		
(AA) **Salaries from new jobs** (Y x Z)	**$**	**381,927,060**	**$**	**400,870,738**
(BB) State income tax rate		2.50%		
(CC) **Income tax on new job salaries** (AA x BB)	**$**	**9,548,177**	**$**	**10,021,768**
(DD) **State fiscal impact** (S + V + CC)	**$**	**33,411,797**	**$**	**35,069,030**
(EE) **Total money generated** (Q + S + AA)	**$**	**768,873,969**	**$**	**807,010,310**
Present Value			**$**	**11,373,958,568**

Sources and Notes:

a) Data on visitors to P&F and Historic Sites from Attendance Report, Fiscal Year 2002, NJ State Park Service

b)"Economic Impact of Visitors to Division of Parks and Forestry Sites: Statewide Money Generation Model, Trends 2001
Division of Parks and Forestry, Nov. 2003. Output multiplier for daytime visitors reflects meals and beverages; output multiplier for overnight visitors reflects hotels, lodging, and amusement.

c) Visitors' expenditures generate earnings, a portion of which is taxable as business profit or taxable income. While the make-up of these earnings varies from state to state, studies suggest that on average 20% - 60% of these earnings are subject to income tax. The study cited in Note (b) applied a conservative figure of 30%, which is used in this general analysis

d) Salaries for new jobs based on $35,963 (in '01 $) per employee per year. The figure is the median salary for all employees of NJ employers based on U.S. Census Bureau data on biweekly payrolls as of March 12, 2001; earnings for persons not classified as "employees" are not included, e.g., sole proprietors, partnerships, etc.

e) 2003 $ calculated using average annual inflation rate, 1993- 2003 (Urban, All-Item CPI): 2.45%
f) PV: 5% discount rate, 25 years

Table 3 Value of State Park and Forest Land by County

County	Total Land Area (acres)	State P&F Area (acres)	% P&F in County	Land Acquisition Value ($/acre)	State P&F Land Value
ATLANTIC	358,000	9,200	2.6%	$ 1,012	$ 9,310,400
BERGEN	149,760	850	0.6%	$ 25,176	$ 21,399,600
BURLINGTON	512,200	129,062	25.2%	$ 3,452	$ 445,577,521
CAMDEN	142,080	9,200	6.5%	$ 1,096	$ 10,082,464
CAPE MAY	163,200	15,797	9.7%	$ 2,319	$ 36,640,352
CUMBERLAND	312,960	-	-	$ 1,366	0
ESSEX	80,640	-	-	$ 38,371	0
GLOUCESTER	208,000	-	-	$ 1,731	0
HUDSON	30,080	1,211	4.0%	0	0
HUNTERDON	275,200	6,363	2.3%	$ 7,363	$ 46,852,423
MERCER	144,640	2,454	1.7%	$ 10,812	$ 26,532,820
MIDDLESEX	198,400	2,596	1.3%	$ 12,944	$ 33,602,261
MONMOUTH	302,080	5,452	1.8%	$ 5,433	$ 29,620,716
MORRIS	300,160	5,733	1.9%	$ 3,178	$ 18,218,098
OCEAN	407,040	24, 261	6.0%	$ 1,915	$ 46,459,815
PASSAIC	118,400	22,549	19.0%	$ 5,436	$ 122,570,727
SALEM	216,320	1,413	0.7%	$ 1,696	$ 2,395,855
SOMERSET	195,200	9,474	4.9%	$ 7,734	$ 73,269,169
SUSSEX	333,440	52,609	15.8%	$ 3,504	$ 184,349,827
UNION	65,920	0	0	0	0
WARREN	229,120	14,618	6.4%	$ 4,033	$ 58,956,441
Total or Average	**4,742,840**	**312,844**	**6.6%**	**$ 3,727**	**$ 1,165,838,487**
Total in 2003$					**$ 1,195,101,033**

Sources and Notes

a) State Parks and Forests (P&F) Area by County: NJ State Park Service fact sheets on individual state park or forest (as posted in NJDEP website)

b) Some parks and forests are located in more than one county and in this case total acreage was allocated based on maps in New Jersey's Wild Places and Open Spaces (Franklin Maps, 1999)

c) Land acquisition values calculated from Green Acres Program data, Jan. 1999- Dec. 2003

d) Average annual inflation rate, 1999-2003 (Urban, All-item CPI): 2.51%

Table 4 Estimated Value of State P&F Share of Open Space Acquired (1999-2003)

County (Co)	% P&F Area in Co [see note a]	Open Space (OS) Acquired (Acres)	Share of P&F in OS Acquired (Ac)	Ave. Cost/Acre ($) [see note c]	Value of P&F Acquired ($)
Atlantic	2.6%	13,425	349.1	1,012	353,239
Bergen	0.6%	54	0.3	25,176	8,157
Burlington	25.2%	2,806	707.1	3,452	2,440,951
Camden	6.5%	249	16.2	1,096	17,739
Cape May	9.7%	4,378	424.7	2,319	984,800
Cumberland	0	10,708	0	1,366	0
Essex	0	348	0	38,371	0
Gloucester	0	2,778	0	1,731	0
Hudson	4.0%	0	0	n/a	n/a
Hunterdon	2.3%	4,755	109.4	7,363	805,254
Mercer	1.7%	778	13.2	10,812	143,000
Middlesex	1.3%	474	6.2	12,944	79,761
Monmouth	1.8%	2,128	38.3	5,433	208,106
Morris	1.9%	6,198	117.8	3,178	374,248
Ocean	6.0%	5,303	318.2	1,915	609,315
Passaic	19.0%	2,039	387.4	5,436	2,105,961
Salem	0.7%	3,547	24.8	1,696	42,110
Somerset	4.9%	271	13.3	7,734	102,700
Sussex	15.8%	11,705	1,849.4	3,504	6,480,263
Union	n/a	0	n/a	n/a	n/a
Warren	6.4%	6,646	425.3	4,033	1,715,412
Total or Avg.	**6.6%**	**78,588**	**4,801**	**3,727**	**16,471,014**

Sources and Notes

a) NJ County Land Area: U.S. Census Bureau; PF as % of county area calculated from Table 3.

b) State Parks and Forests (P&F) Area by County: NJ State Park Service fact sheets on individual state park or forest (as posted in NJDEP website); some parks and forests are located in more than one county and in this case corresponding areas calculated from map of New Jersey's Wild Places and Open Spaces (Franklin Maps, 1999).

c) Green Acres Program Data on Land Acquisition Costs by County, 1999-2003; average GA cost/acre from Table 3.

Table 5 Green Acres Open Space Acquisitions and Population Density

County	Open Space (OS) Acquisitions (a)	OS Acres Acquired (a)	Avg. Cost/Acre ($)	Population Density (b)
Hudson (C)	0	0	n/a	13,043
Essex	$ 13,342,970	348	$ 38,371	6,285
Union (C)	0	0	n/a	5,059
Bergen	$ 1,357,722	54	$ 25,176	3,776
Passaic	$ 11,081,845	2,039	$ 5,436	2,639
Middlesex	$ 6,135,766	474	$ 12,944	2,422
Camden	$ 272,720	249	$ 1,096	2,289
Mercer	$ 8,414,117	778	$ 10,812	1,553
Monmouth	$ 11,559,811	2,128	$ 5,433	1,304
State Average Population Density				***1,134***
Morris	$ 19,694,246	6,198	$ 3,178	1,003
Somerset	$ 2,098,350	271	$ 7,734	976
Ocean	$ 10,158,325	5,303	$ 1,915	803
Gloucester	$ 4,808,706	2,778	$ 1,731	784
Burlington	$ 9,688,796	2,806	$ 3,452	526
Atlantic	$ 13,589,873	13,425	$ 1,012	450
Cape May	$ 10,153,761	4,378	$ 2,319	401
Cumberland	$ 14,628,952	10,708	$ 1,366	299
Warren	$ 26,804,442	6,646	$ 4,033	286
Hunterdon	$ 35,009,227	4,755	$ 7,363	284
Sussex	$ 41,014,815	11,705	$ 3,504	277
Salem	$ 6,014,087	3,547	$ 1,696	190
Total or Avg.	**$ 245,828,529**	**78,588**	**$ 3,128**	**1,134**

Results by density:

Top 7	$ 32,191,023	3,163	$ 10,177	
Middle 7	$ 66,422,351	20,262	$ 3,278	
Bottom 7	$ 147,215,155	55,162	$ 2,669	

9 counties density>avg.	$ 52,164,952	6,069	$ 8,595	
12 counties density<avg.	$ 193,663,578	72,519	$ 2,671	

Sources and Notes

a) Green Acres Program Data on Land Acquisition Costs by County, 1999-2003

b) US Census Bureau, 2000 U.S. Census

c) Hudson and Union Counties had no Green Acres-funded open space acquisition during 1999-2003.

Table 6 Willingness to Pay (WTP) for Improved Watershed Health

	WTP per household per year 1997 $ (b)	WTP per household per year 2003 $ (c)	Total WTP $ million (d)	Present Value Benefits $ million (e)
WTP to maintain existing surface water quality (a)	$ 33	$ 35	$ 107	$ 1,508
WTP to improve surface water quality to minimum acceptable level (a)	$ 81	$ 85	$ 260	$ 3,664

Sources and Notes

a) WTP: willingness to pay or total economic value (maximum amount) that a user is prepared to pay for a good or service

b) Source of WTP data: Johnston et al (1999). Estimating WTP and Trade-offs with Different Payment mechanisms: An Evaluation of a Funding Guarantee for Watershed Management. J. of Envir. Econ. and Management 38:97-120.

c) 2003 $ calculated using average annual inflation rate, 1993- 2003 (Urban, All-Item CPI): 2.45%

d) NJ households: 3,064,645 estimated, U.S. Census Bureau

e) PV: 5% discount rate, 25 years

Table 7 Land for Carbon Sequestration by Forest Type and by Type of Opportunity, in Acres (a)

Forest Type	Private Land	Public Land (b)	Afforest/Reforest/ SRWC	Atl. White-Cedar Rest.	Urban Forestry	Total
loblolly/shortleaf pine	220,783	90,467	12,975	0	0	324,225
oak/pine	110,445	45,255	6,490	0	0	162,190
oak/hickory	450,770	184,705	26,490	0	459,168	486,415
oak/gum/cypress	34,315	14,060	2,017	42,500	0	92,892
elm/ash/red maple	81,184	33,266	4,771	0	82,697	201,918
northern hardwoods	99,751	40,874	5,862	0	101,610	294,810
aspen/birch	851	349	50	0	0	1,250
Total	**998,099**	**408,976**	**58,655**	**42,500**	**643,475**	**2,151,705**

Source and Notes:

a) Carbon Sequestration and CO2 Emission Credits: A Market-Based Forest Conservation Program for New Jersey
2003, Far Horizons Corporation for USDA Forest Service, Northeastern Area

b) In NJ, 81% of the 408,976 acres of publicly held forests (in public lands) are owned by the state. Fifty sites in public lands are designated as state parks & forests covering 312,844 acres. The rest are held by municipalities, townships, and counties.

c) U.S. Forest Service, Northeastern Research Station Forest Assessment Data Base

Table 7a Estimated Value of Carbon Storage and Sequestration in State Parks and Forests

	Sequestration	Storage	Total
A) State Parks and Forests (P&F) acreage *[a]*	312,844	312,844	
B) State P&F hectarage: 1 hectare= 2.471 acres	126,606	126,606	
C) Annual carbon seq.in NJ (tons/hectare/yr) *[b]*	1.2		
D) Carbon storage in NJ (tons/hectare) *[b]*		38.3	
E) Annual carbon seq. in State P&F (B x C, tons/yr)	151,927		
F) Carbon storage in State P&F (B x D, tons)		4,849,019	
G) Value of carbon emissions credit ($/ton) *[b]*	$ 20	$ 20	
H) Value of annual carbon seq. in SF (E x G)	$ 3,038,550	$ 6,880,996	$ 9,919,546
I) Value of carbon storage in SF (F x G)		$ 96,980,374	
J) Present value of sequest. & storage *[c]*	**$ 42,825,149**	**$ 96,980,374**	**$ 139,805,523**

Source and Notes:

a) In NJ, 81% of the 408,976 acres of publicly held forests (in public lands) are owned by the state. Fifty sites in public lands are designated as state parks & forests covering 312,844 acres. The rest are held by municipalities, townships, and counties.

b) U.S. Forest Service, Northeastern Research Station Forest Assessment Data Base; carbon units in metric tons

c) PV: 5% discount rate, 25 years

Table 8 Estimate of Soil Erosion Control Value
based on Conservation Reserve Enhancement Program (CREP)

	10-year period (CREP)	25-year period
A) One-time incentive per acre (a)	$ 100.00	$ 100.00
B) Cash rental for agricultural land per acre (2002 $) (b)	$ 55.50	$ 55.50
C) $ 2003 value of cash rental (c)	$ 56.86	$ 56.86
D) State Park & Forest acreage (d)	312,844	312,844
E) Land rental value (C x D)	$ 17,788,310	$ 17,788,310
F) Annual value of incentive (e)		$ 2,219,705
G) Total annual value (E+F)		$ 20,008,015
H) Present value (PV) of land rental (f)	$ 137,356,613	$ 250,707,453
I) Incentive value (A x D)	$ 31,284,400	$ 31,284,400
J) **PV of erosion control in P&F lands** (H+I)	**$ 168,641,013**	**$ 281,991,853**

Sources and Notes:

a) Conservation Reserve Enhancement Program (CREP) New Jersey State, USDA Farm Service Agency, 2004

b) National Agricultural Statistical Service, USDA, 2002 Agricultural Cash Rental Statistics

c) 2003 $ calculated using average annual inflation rate, 1993- 2003 (Urban, All-Item CPI): 2.45%

d) Estimated total public land area classified as State Parks & Forests: 312,844 acres.

e) Annual amortization 25 years, 5%

f) PV: 5% discount rate, 10 years (CREP-specified time horizon) and 25 years.

Table 9 Farmers' WTP for Groundwater Protection

A) WTP for Groundwater Protection per farm (1999$) {a}	3,475
B) Inflation Factor {b}	1.1017
C) WTP for Groundwater Protection per farm (2003$) [AxB]	3,828
D) No. of Farmers in NJ {c}	9,600
E) **Total WTP ($)** [CxD]	**36,751,400**
F) **Annual Equivalent** {d}	**2,607,602**

Sources and Notes

a) WTP value adapted from "Lichtenberg, E. and Zimmerman, R. 1999. Farmers' Willingness to Pay for Groundwater Protection. Water Resources Research 35: 833-841".

b) Average annual inflation rate, 1993-2003 (Urban, All-Item CPI): 2.45%

c) No. of NJ Farmers, U.S. Census Bureau, 2000

d) Annual amortization over 25 years at 5%

Table 10 State Park Service Expenditures, 1993- 2002

Year	Expenditure in Current $ (a)	Inflation Factor (b)	Expenditure in 2003 $
1993	$ 22,700,000	1.274	$ 28,916,484
1994	$ 22,358,000	1.243	$ 27,799,732
1995	$ 23,021,000	1.214	$ 27,939,581
1996	$ 25,192,000	1.185	$ 29,843,269
1997	$ 24,497,534	1.156	$ 28,326,580
1998	$ 24,117,000	1.129	$ 27,219,685
1999	$ 28,215,500	1.102	$ 31,083,907
2000	$ 31,257,518	1.075	$ 33,611,692
2001	$ 33,583,032	1.050	$ 35,248,759
2002	$ 33,845,412	1.025	$ 34,674,625
Total	**$ 268,786,996**		**$ 304,664,314**
Average	**$ 26,878,700**		**$ 30,466,431**
Present Value			**$ 429,392,195**

Sources and Notes:

a) NJ Division of Parks and Forestry, FY03 State of the Division Report, March 2003

b) 2003 $ calculated using average annual inflation rate, 1993- 2003 (Urban, All-Item CPI): 2.45%

c) PV: 5% discount rate, 25 years

Table 11 State Park Service Economic Impact

	2003 $	
A) Agency Direct Expenditures (a)	**$**	**30,466,431**
B) Indirect Sales Multiplier (b)		2.00
C) Sales Benefits from Expenditure excl. sales tax	$	60,932,862
D) Retail Sales Tax rate		6%
E) Sales Tax Revenue (C x D)	**$**	**3,655,972**
F) Sales Benefits in million dollars *[C/1,000,000)*		61
G) Jobs Multiplier (c)		30
H) **New Jobs from Sales Benefits** (F x G)		**1,830**
I) Annual Salary Per New Job (d)	$	37,747
J) **Salaries from New Jobs** (H x I)	**$**	**69,076,589**
K) Income Tax Rate		2.50%
L) Income Tax on New Job Salaries (J x K)	**$**	**1,726,915**
M) **Total Money Generated** (C + E + J)	**$**	**135,392,338**
N) **Present Value of benefits** (e)	**$**	**1,908,212,100**

Sources and Notes:

a) NJ Division of Parks and Forestry, FY03 State of the Division Report, March 2003. Agency expenditure from Table 10.

b) Indirect sales multiplier is usually between 1.2 to 2.8 in the U.S., varying with the complexity of the economy. For this analysis, 2.0 was chosen as the midpoint of this range.

c) Jobs mulitplier varies by industry, ranging from 10 to 50 jobs per million dollars of sales in the U.S. tourism industry. For this analysis, 30 was chosen as the midpoint of this range.

d) Salaries for new jobs based on $35,963 (in '01 $) per employee per year. The figure is the median salary for all employees of NJ employers based on U.S. Census Bureau data on biweekly payrolls as of March 12, 2001; earnings for persons not classified as "employees" are not included, e.g., sole proprietors, partnerships, etc.

e) PV: 5% discount rate, 25 years

Table 12 State Parks and Forests Capital Improvement Expenditures, 1994 - 2003

Year		Capital Expenditures in current $ (a)	Capital Expenditures in 2003 $ (b)
1994		13,000,000	16,164,081
1995		2,000,000	2,427,313
1996		0	-
1997		38,300,000	44,286,418
1998		2,400,000	2,708,763
1999		2,225,000	2,451,195
2000		10,450,000	11,237,047
2001		13,190,000	13,844,227
2002	see note (c)	8,300,000	8,503,350
2003		2,300,000	2,300,000
Total		**92,165,000**	**103,922,394**
Average		**9,216,500**	**10,392,239**
Present Value			**146,467,646**

Source and Notes:

a) NJ Division of Parks and Forestry, FY '03 State of the Division Report, March 2003

b) 2003 $ calculated using average annual inflation rate, 1993- 2003 (Urban, All-Item CPI): 2.45%

c) In FY02, although $16.5 million was appropriated, 49.6% of the fund or $8.2 million had been placed in reserve.

d) PV: 5% discount rate, 25 years

Table 13 Economic Impact of P&F Construction Expenditures

		2003 $
A) Avg. Annual Expenditures on New Construction *[a)*	$	10,392,239
B) Output Multiplier for New Construction (b)		2.25
C) Additional Benefits Generated (sales revenues excl. sales tax)	**$**	**23,382,539**
D) Retail Sales Tax rate		6%
E) Sales Tax Revenue	**$**	**1,402,952**
F) Portion of Sales Subject to Income Tax (c)		30%
G) Sales subject to income tax	**$**	**7,014,762**
H) State Income Tax Rate		2.5%
I) Income Tax Revenue	**$**	**175,369**
J) Temp. Const. Jobs Created		not estimated
K) Additional Benefits Generated in million dollars		23
L) Employment Multiplier (b)		30.8
M) New Permanent Jobs Created		**708**
N) Annual Salary Per New Job (d)	$	37,747
O) Salaries from New Jobs	**$**	**26,724,876**
P) Income tax rate		2.50%
Q) Income Tax on New Jobs Salaries (O x G)	**$**	**668,122**
R) Total Money Generated (C+E+O)	**$**	**51,510,367**
S) Present Value of Benefits (e)	**$**	**725,984,257**

Sources and Notes:

a) NJ Division of Parks and Forestry, FY03 State of the Division Report, March 2003

b) Multipliers for construction industry adapted from Shaufelberger, J. E. 1998. Study of the Economic Impact of the Construction Industry in Washington State, Dept. of Construction Mgnt, Univ. of Washington.

c) Visitors' expenditures generate earnings, a portion of which is taxable as business profit or taxable income. While the make-up of these earnings varies from state to state, studies suggest that on average 20% - 60% of these earnings are subject to income tax. The study cited in Note (b) applied a conservative figure of 30%, which is used in this general analysis

d) Salaries for new jobs based on $35,963 (in '01 $) per employee per year. The figure is the median salary for all employees of NJ employers based on U.S. Census Bureau data on biweekly payrolls as of March 12, 2001; earnings for persons not classified as employees are not included, e.g., sole proprietors, partnerships, etc. Inflated to 2003 $ using average annual inflation rate, 1993- 2003 (Urban, All-Item CPI): 2.45%

e) PV: 5% discount rate, 25 years

Table 14 Estimated Existence Values of State P&F

A) Mean Annual WTP per household, lower range in 1992$		10
B) Mean Annual WTP per household, upper range, 1992$		20
C) Inflation Factor		1.3107
D) NJ Households	3,064,645	
E) Mean Annual WTP per household, lower range in 2003$ (AxC)		13
F) Mean Annual WTP per household, upper range in 2003$ (BxC)		26
G) Total WTP, lower range 2003$ (DxE)	40,167,666	
H) Total WTP, upper range 2003$ (DxF)	80,335,332	
I) Present Value Benefits, lower range	**$ 566,120,860**	
J) Present Value Benefits, upper range	**$ 1,132,241,720**	

Sources and Notes

a) Mean annual WTP values adapted from "Silberman, J., D.A. Gerlowski and N.A. Williams. 1992. Estimating Existence Value of Users and
Non-Users of New Jersey Beaches. Land Economics 68: 225-236".

b)Estimated NJ households, U.S. Census Bureau

c) Average annual inflation rate, 1992-2003 (Urban, All-Item CPI):2.49%

d) PV: 5% discount rate, 25 years

Table 15 Estimated Value of Standing Timber in NJ State Forests

Forest Type	Area in (acres) (a,b)	Volume in bd-ft (board-feet) (c)	Price $ per 000 bd-ft (d)	Estimated Value ($)
Hard Pine	52,724	226,397,576	68	15,395,035
Oak/Pine	26,375	113,252,593	400	45,301,037
Oak/Hickory	107,646	462,232,242	350	161,781,285
Oak/Gum/Cypress	8,194	35,185,757	232	8,163,096
Elm/Ash/Red Maple	19,387	83,249,602	50	4,162,480
Nothern Hardwoods	23,821	102,288,951	350	35,801,133
Aspen/Birch	203	873,388	30	26,202
Total or Avg.	**238,351**	**1,023,480,108**	**264**	**270,630,267**

Sources and Notes:

a) Forest Statistics for New Jersey: 1987 and 1999, US Forest Service.

b) Total public forest land area (state, county, municipal) = 408,975 acres, of which 238,336 acres (or 58%) are classified as state forests; total above differs due to rounding.

c) Average timber volume per acre (bd-ft) = 4,294. A board-foot (bd-ft) is a unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent

d) Except for stumpage prices for Oak/Hickory Forest Type and Northern Hardwoods Forest Type, all prices from Southern New England Stumpage Price Survey, 2nd Qtr 2003.
Price data for Oak/Hickory and Northern Hardwoods provided by Ed Lempicki, NJFS